

**REMARKS****Summary of the Office Action**

Claims 1-3, 10, 11 and 13-18 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole (SCIENCE, vol. 221, No. 4614, Sept. 2, 1983, pp. 915-920) in view of Tanaka (PROCEEDINGS OF THE 35th INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, vol. 2, July 24-28, 2000, pp. 925-930).

Claims 4 and 20 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Cooper et al. (US, 5,039,351).

Claims 5-9, 21 and 22 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Wright (US, 5,143,802).

Claims 12 and 19 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Tilley et al. (US, 4,910,105).

Title of the Invention is objected to because it is not descriptive.

**Summary of Response to the Office Action**

Claims 1 and 13-15 are amended to improve the form of claim language. Title of the Invention is amended, as suggested by the Examiner. In addition, Specification is amended to correct the transliteration errors. Accordingly, claims 1-22 are currently pending for consideration.

**Amendment to Specification**

Paragraphs [0010], [0011], [0022], [0023], [0035], [0036], [0038], [0041], [0043], [0047] and [0049] of the original Specification are amended to correct the transliteration errors.

Applicants respectfully submit that no new matter is introduced by this Amendment.

Accordingly, Applicants respectfully request the entry of this amendment to the Specification.

**All Claims Define Allowable Subject Matter**

Claims 1-3, 10, 11 and 13-18 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole in view of Tanaka. Claims 4 and 20 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Cooper et al. Claims 5-9, 21 and 22 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Wright. And, claims 12 and 19 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cole and Tanaka, and further in view of Tilley et al. Applicants respectfully traverse the rejection of claims at least for the following reasons.

With respect to independent claims 1 and 13, as amended, Applicants respectfully submit that none of the cited references, whether taken in combination or individually, teaches or suggests the features including at least “the contact portion of the electrolyte medium at the operating medium side is disposed in a low-temperature side while the contact portion of the electrolyte medium at the permeable electrode side is disposed in a high-temperature side, and the contact portion of the electrolyte medium at the operating medium side and the contact portion of the electrolyte medium at the permeable electrode side are set substantially under the same pressure” and “the operating medium is vaporized at the permeable electrode side while the operating medium is condensed at a condensing portion, the contact portion of the electrolyte medium at the operating medium side is disposed in a low-temperature side while the contact portion of the electrolyte medium at the permeable electrode side is disposed in a high-temperature side, and a pressure difference between the contact portion of the operating medium at the first terminal and the condensing portion is equal to or less than a difference in a vapor pressure of the operating medium caused by a temperature difference between the contact

portion of the operating medium at the first terminal and the condensing portion.”

On page 5 of the Action, the Office admits that “Cole does not disclose where the pressure difference between the contact portion of the operating medium with the first terminal and the condensing portion is equal to or less than the vapor pressure difference of the operating medium which is caused by a temperature difference between the two aforementioned elements.” As such, the Office relies on Tanaka to allege that Tanaka discloses “the effect of the pressure drops of the tested cell design seem to be negligible, therefore the vapor pressures would be dependant upon the temperature of various portions of the cell. This would lead to a pressure difference between these two elements due to temperature difference.” Applicants respectfully disagree.

On page 4 of the Action, the Office alleges that Cole discloses “an electrolyte medium having icon conductivity, in the form of beta”-alumina solid electrolyte (BASE).” In addition, the Office alleges on page 6 of the Action that Tanaka discloses “a design for a small-sized AMTEC cell, wherein a molybdenum mesh electrode is in contact with a BASE tube (a solid electrolyte) between two tube heaters.” Applicants respectfully submit that in case of the commonly used AMTEC (including the examples of Cole and Tanaka), BASE is placed under the even temperature such that the cathode side and the anode side of the AMTEC becomes the same temperature. Therefore, the metal sodium contacting the anode side becomes the same temperature as well. A sodium vapor pressure corresponding to this temperature is generated, or a pressure greater than such sodium vapor pressure must be applied by means of a pump, etc., in order to prevent the liquid sodium from being evaporated. Thus, a pressure difference at the cathode side, placed in almost vacuum, is necessarily generated.

As indicated in the electromotive force calculation formulas (2) and (3) of Cole (page 916), the electromotive force of the commonly used AMTEC is derived from this difference in the sodium vapor pressure. For power generation, it is essential that the difference in sodium vapor pressure is present between the two sides that sandwiches BASE, in principle. In another word, when the sodium vapor pressure difference is zero, the electromotive force becomes zero. As such, in order to continuously generate electric power by the commonly used AMTEC, a pump (i.e., a wick utilizing capillary force, etc.) for circulating the condensed liquid sodium from a low-temperature/low-pressure section to a high-temperature/high-pressure section is necessary.

On the other hand, in the present invention, sodium is imported as ions from a low-temperature end of BASE to a high-temperature end in the form of ions without being reduced to neutral sodium atoms in the mid-stream. Thus, the metal sodium would not be contacting the high-temperature cathode, and a vapor pressure, in principle, would not be generated. Therefore, it is possible to create a large difference in temperature without generating the difference in the vapor pressure. In addition, it is also possible to generate high electromotive force even when the vapor pressure difference is zero. Furthermore, the cell of the present invention does not require a pump etc. for sodium circulation.

Applicants respectfully note that in theory, the energy generated from sodium being expanded isothermally at the high-temperature cathode of AMTEC is converted into the electromotive force. In the present invention, the energy generated from sodium ions being dispersed from the low-temperature section to the high-temperature section of the electrolyte, also contributes to the electromotive force. Accordingly, Applicants respectfully submit that the theoretical electromotive force is also different.

MPEP §2143, Option (A), indicates that, to establish a *prima facie* obviousness, there must be a finding that the prior art included each element claimed, a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that one of ordinary skill in the art would have recognized that the results of the combination were predictable. Accordingly, since Cole and Tanaka, whether taken singly or combined, fail to teach or suggest at least the features of generating the temperature difference without generating the vapor pressure difference, and absence of mechanical means such as pump and capillary tube for circulating sodium within the cell, Applicants respectfully assert that the Office has not established a *prima facie* case of obviousness. Furthermore, Applicants respectfully submit that Tanaka fails to cure the deficiencies of Cole, Cooper et al. fails to cure the deficiencies of Cole and Tanaka, Wright fails to cure the deficiencies of Cole and Tanaka, and Tilley et al. fails to cure the deficiencies of Cole and Tanaka.

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In light of the arguments presented above, Applicants respectfully request that the rejection of claims under 35 U.S.C. §103(a) be withdrawn. Moreover, Applicants respectfully submit that dependent claims 2-12 and 14-22 are allowable with regard to a respective one of the amended independent claims 1 and 13 from which they respectfully depend, as well as the individual features that dependent claims 2-12 and 14-22 recite.

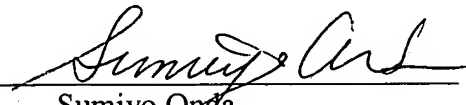
**CONCLUSION**

In view of the foregoing remarks, Applicants respectfully request reconsideration of this application, withdrawal of all rejections, and the timely allowance of all pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution.

If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.R.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

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